

Preliminary 2006 *Astragalus magdalenae* var. *peirsonii* Survivorship and Demography Findings

Jeremy Groom, Tony McKinney, Tyler Grant, Clark Winchell
U.S. Fish and Wildlife Service, Carlsbad Field Office

In the spring of 2005 The Carlsbad Field Office compared the density of *Astragalus magdalenae* var. *peirsonii*, or Peirson's milk-vetch, in areas open and closed to off-highway vehicles (OHVs). Additionally, a manipulative mark-recapture experiment was conducted to quantify the impact of OHVs on treatment and control plants. We conducted a second study effort between December 2005 and June 2006 to estimate survivorship of individual *A. m. var. peirsonii* in areas open and closed to OHVs, as well as determine the quantity and timing of reproductive output.

The study areas consisted of two 250-hectare plots demarcated on a GIS. The two areas were located almost entirely within the Gecko Management Area along the western side of the Algodones Dune system. The OHV-open study area lay directly east of the Roadrunner Campground, a popular OHV staging area. The other study area lay within an interim closure established in 2001, approximately 2 km to the southeast of the open study area. We randomly selected dune bowls within each study area and marked individual *A. m. var. peirsonii* within each bowl. We recorded plant reproductive state, seed pod number, and any apparent OHV damage. Plants were revisited monthly and similar data recorded.

The Algodones Dunes received unusually high amounts of rainfall in 2004-2005, which culminated in a 9-cm rainfall event in early August 2005. Only 0.86 cm of rainfall fell between September 2005 and June 2006. Consequently, we observed no germinating plants in the dunes over the course of our 2006 study. As of December 2005 the dunes were retaining moisture between 15 and 50 cm below the surface. Despite the presence of this moisture, few *A. m. var. peirsonii* survived from the spring of 2005 (5% of the 1+ year plants marked in 2005) and many of the living plants appeared to be senescing. We recorded apparent plant senescence (percent of vegetative material that was dead) as we believed it could potentially serve as a useful predictor of plant mortality patterns.

Only 54% of the marked plants produced pods. The average number of seed pods produced per plant across all plants was 119. Reproducing plants produced an average of 224 pods per plant. Average stem diameter was 1.5 cm (range: 0.6-3.2 cm). We compared multiple known-fates survivorship models in Program MARK. The top models indicated that plant survivorship depended on plant location (open or closed study area), season (December-April or May-June), and the percent of the plant material dead in December. When considering survivorship estimates for plants with average levels of apparent senescence in December, plant mortality was 5% greater per month in the OHV-open study area than the OHV-closed study area between December and April, or 20% greater when considered cumulatively over these months. This time period was biologically significant for *A. m. var. peirsonii*, as 89% of the seed pods were produced in March and April. Over 90% of putative OHV plant damage was reported in the open area, further implicating OHVs as a cause for the disparity of plant survivorship. Finally, our survivorship estimates for plants in the open area between December and April may have been biased high relative to years in which germination occurred, as smaller plants may be less resilient to vehicular impact (Groom et al. 2005) and plants in more OHV-accessible portions of the dune bowls may have already succumbed to OHV impact the previous year.